



Date: March 27, 2020

Marlene H. Dortch, Secretary
Federal Communications Commission
445 12th Street, NW
Washington, DC 20554

Re: Rural Digital Opportunity Fund
AU Docket No. 20-134
WC Docket Nos. 19-126 and 10-90

Dear Ms. Dortch,

We are writing to you to provide comments on the proposed RDOF Phase I auction procedures. We are fully supportive of the Commission's goals of upgrading and improving broadband service to the benefit of all Americans, and specifically those living in rural environments.

Siklu delivers multi-gigabit wireless fiber connectivity in urban, suburban, and rural areas. Operating in the mmWave bands, Siklu's wireless solutions are used by leading service providers and system integrators to provide 5G Gigabit Wireless Access (GWA) services. In addition, Siklu solutions are ideal for Smart City projects requiring extra capacity such as video security, WiFi backhaul, and municipal network connectivity all over one network. Over 100,000 Siklu carrier-grade systems are delivering interference-free Gigabit performance worldwide.

We believe strongly that the right approach is for the FCC to set the requirements for these services in terms of capacity and latency, allowing the service provider/WISP and vendor community to explore all options on how to meet these requirements.

However, while most of the proposed auction procedures adopt this approach, unfortunately it has a provision in paragraph 51 that would exclude fixed wireless technology from being eligible to bid at the Gigabit tier. This provision actually prohibits one of the best solutions for the RDOF goals. Fixed wireless is cheaper and faster than any wireline solution and has the ability to deliver Gigabit download speeds to the home. Many WISP networks actually deploy both fiber and fixed wireless as a harmonious blend of "best in breed" technologies. Fiber bringing a large pipe to an area and wireless covering the last mile. All at Gigabit speeds.

The Commission needs to be aware that between the time CAF II auction was held in 2018 and today, Gigabit wireless solutions have exploded on to the market. Siklu alone is launching our 4th generation 60 GHz product over the past three years, all of them supporting Gigabit access



speeds with single digit latencies. The current year of 2020 will see another wave of products and services based on these 60 GHz technologies as the latest chipsets enabling powerful, low cost systems hit the market last summer with product releases trending towards this summer.

Indeed, systems and solutions in the 60 GHz and 70/80 GHz bands which are used worldwide are often referred to as “Fixed 5G” for their ability to deliver Gigabit speeds, low latency, and to connect lots of “things” to the network. Clearly the Commission understands the potential of 5G after the recent mmWave auctions for the mobile world. Fixed 5G as noted offers similar if not faster performance as mobile 5G – and the US has staked a claim to be a leader in all 5G technologies.

We at Siklu believe that the Commission should remain technology-neutral in how these services are delivered in RDOF, as long as the applicant proposes to meet the performance benchmarks which many 60 GHz systems do today. The Commission has the ability and capacity to review short-form applications on a case-by-case basis, and it should do so here in order to ensure that rural consumers are not disadvantaged by a categorical exclusion of fixed wireless technology. Siklu has been selling and deploying thousands of these last mile networks over the past three years in towns like Alamosa, CO and Santa Cruz, CA to great success.

We encourage the Commission to allow fixed wireless technology be used for Gigabit bids, stay focused on end results, and let the service provider and vendor community use their creativity and newly available technologies to deliver on the promise.

Sincerely,

David A. Sumi
VP of Marketing
Siklu Communications

MultiHaul™ cTU - Small PtMP 60GHz Radio Datasheet



Same Features and Throughput of the MultiHaul™ TU in a Form Factor 85% Smaller

The MultiHaul™ system consists of a Base Unit (BU) operating over millimeter waves and connecting Terminal Units (TU) and now the new ultra small compact TU (cTU). MultiHaul™ brings the advantages of mmWave spectrum – multi-gigabit capacity, immunity to interference and massive amounts of available spectrum - to a cost effective small form factor PtMP solution. With the cTU, the customer premise side of the system has been reduced over 85% in total volume when compared to the standard TU with no loss in performance and features. A size only 6.5”x3.1”x1” and a selection of colours will blend the cTU into existing surroundings, making it even easier to deploy.

A Wide Range of Applications

- Security / Safe City Networks
- Gigabit to the Home
- Smart City
- Business Services
- Wi-Fi Backhaul

Ready-Set-Go

The plug and play system is designed for an easy single person installation with a goal of self-installation. The patent-pending scanning antenna automatically aligns with the Base Units. For buildings with difficult roof-top access, a single base unit needs to be installed on a roof to serve multiple locations. The Base Unit (BU) supports advanced auto-provisioning: Terminal Units (TU and cTU) configuration files are stored in the BU to enable early and advanced provisioning, optionally with no IP address on the TU/cTU. The TU/cTU can be located on building sides with no need for internal re-wiring of building to achieve net gigabit throughput.

Small but Powerful – Virtually Invisible

There can be no doubt that the smaller the TU is, the more options customers have for deployment. Typically, in wireless systems, going smaller means sacrificing performance. With the cTU Siklu has broken new ground delivering the exact same throughput as the TU but in a form factor that is dramatically smaller.

In addition to the technology that goes into enabling identical performance in an ultra-small package comes the ability to choose from a selection of colours to further reduce the sight lines of deployed cTUs.

Always-On Mission Critical Networks

When you can't afford to lose a video stream, critical safe city sensor data or any other mission critical data, you need a wireless network that's as reliable and secure as fiber. With maximal immunity to interference and hacker-proof links with embedded AES encryption, MultiHaul™ delivers a network you can count on.

Self-Installation

When operators and Smart Cities are considering deployments of mmWave networks, the total cost of ownership is reviewed, just like with any new product. At Siklu we understand the large role in a business case that installation can play with costs anywhere from \$100 to upwards of \$500 or more. The cTU represents the first of several advances Siklu will be introducing over the next 12 months enabling a true, outdoor self-install system for our customers

Fiber Quality with Wireless Flexibility

Siklu's millimeter wave radios successfully combine the capacity of fiber with the flexibility, speed of deployment and low TCO of wireless networks. That's what makes them the world's best-selling millimeter wave radios every year since 2011. They provide rock solid performance, even in very dense networks or under severe weather conditions, in thousands of networks around the globe.

Secure and Physically Immune Narrow Beams

The MultiHaul™ cTU operates over the millimeter wave spectrum using narrow beams. This confers several advantages including complete immunity to interference and network jamming, as well as high security. In contrast to wide-beam wireless systems that need to use multiple strategies to perform in dense areas, and are not successful 100% of the time, the MultiHaul™ cTU is inherently interference-free and secure under any circumstances thanks to a unique combination of narrow beams and high frequencies, same as they are implemented on the standard TU. Multiple subscribers and services can be connected with complete isolation based on physical port, VLAN ID and/or a Terminal Unit.



MultiHaul™ cTU - Small PtMP 60GHz Radio Specifications



The main specifications of the MultiHaul™ compact Terminal Units (cTU) are outlined in the following table.

Topologies	Point to Multi-point Point to Point
Built-in Antenna	Horizontal scanning: 90° Vertical beam-width: 20°
Frequency & Duplexing	57-64GHz TDD
Channels & Width	2 non-overlapping channels, 2160MHz wide
Modulation & Coding	9 level of adaptive coding and modulation
Line Rate (PHY)	Line rate up to 2300 (Mbps)
Aggregate Throughput	Max capacity 1000 (Mbps), license dependent
System Gain (link budget)	124dB (including antenna gain)
Typical Reach	850-980ft. (260-300m) Detailed performance calculations - see Siklu's online link budget calculator: siklu.com/toolsetherhaul_lbc/
Interfaces	1x RJ-45 100/1000 Base-T
Ethernet Features	IEEE 802.1d transparent bridging Provider bridge - VLAN & VLAN stacking Jumbo frames; LLDP
Security	AES 128-bits
Management & Provisioning	TU auto-provisioning from BU, no IP address required on TU; In-band, Out-of-band management Web GUI (one-click configuration of local and remote units) & Embedded CLI SNMPv2/3, TACACS+, RADIUS
Conformance	Radio: US FCC 47 CFR Part 15.255; EN 302 567; EMC: US FCC 47 CFR Part 15; EN 301 489 Safety: UL 60950
Power Supply	PoE, 10W (IEEE 802.3af)
Environmental	Operating Temperature: -22°F÷131°F(-30°C÷55°C); Ingress Protection Rating: IP65
Dimensions (HxWxD)	6.5 x 3.1 x 1 in. / 165 x 80 x 25 mm.
Weight	1/2 lbs. (250 gm), including the Anymount mounting kit.

Rev B0

EtherHaul™ - 8010FX Datasheet



10Gbps 70/80GHz Radio – Wireless Fiber Connectivity

The EH-8010FX delivers up to 10Gbps Full Duplex throughput for high capacity networks in Metro, Aggregation and Infrastructure or Backhaul applications.

Applications for a Wide Range of Vertical Markets

- Fiber Network Extension/ Backup
- Enterprise Multi Gigabit-Connectivity
- Metro and Aggregation Networks
- Multi-Dwelling Unit Gigabit Broadband

Small Size, Easy to Deploy & Manage

The all-outdoor radio has a small footprint and is light weight which makes site acquisition a breeze. The product comes pre-configured out of the box with no license to download greatly simplifying the time and cost for installation. The intuitive web GUI manages local and remote units to enable fast commissioning and configuration.

Wire-speed, AES Secure

Innovative all-HW bridging and AES encryption ensure high-throughput and low latency at any traffic load levels or packet sizes, maintaining high performance and no bottle necks for all the services in the network backbone.

Up to 10Gbps Over Long Distance

The EH-8010FX radio delivers up to 10Gbps full duplex point-to-point wireless Ethernet connectivity with the longest mmWave reach by means of the highest system gain in the market. Incorporating dozens of Siklu innovations, the EH-8010FX is based on the same platform that has been deployed in tens of thousands of links from the EtherHaul™ family.

Exceptional Value, from 2Gbps to 10Gbps

Scalable capacity from 2Gbps full duplex to 10 Gbps full duplex allows deploying what you need and when you need. And with its IP67 construction, the EH-8010FX is extremely rugged and designed to last for years of growth in the harshest conditions at a price that yields quick Return-On-Investment (ROI) and minimizes Total Cost of Ownership (TCO). The advanced up-to-10Gbps system delivers an unbeatable price per Gb. Its small and light form factor lowers installation costs, increases reliability and reduces site visits.

Carrier Class Construction and Performance

High throughput and low latency combine to deliver fiber compatible performance. The EH-8010FX incorporates adaptive bandwidth coding and modulation together with QOS management⁽¹⁾ for high availability and easy integration with Ethernet switches or MPLS routers in highly resilient topologies. The EH-8010FX is designed to connect into existing networks with its support for both copper and fiber 10G interfaces allowing service providers and enterprises to extend their copper or fiber networks.

Massive Spectrum Availability, and High Reuse

The EH-8010FX operates over the interference-free 71-76/81-86GHz E-band spectrum, with a total of 10GHz of bandwidth for use worldwide. By using a high-gain pencil-beam antenna, this helps guarantee spectrum will be available everywhere and maximizes spectrum re-use. Additionally, E-band systems are governed by low



(1) HW revision dependent

EtherHaul™ - 8010FX Specifications



Frequency / Duplexing	71-76GHz / 81-86GHz, FDD
Channel Bandwidth, Modulation & Adaptive Coding	250, 500, 1,250 & 2,000MHz; BPSK to QAM128; Up to 9 levels of hitless adaptive bandwidth, coding and modulation - boost gain by over 29dB
Throughput	Up to 10,000Mbps full duplex (with capacity license)
System Gain	64 / 93 dB (channel bandwidth = 2,000MHz, maximum capacity / minimum modulation) 75 / 97.5 dB (channel bandwidth = 500MHz, maximum capacity / minimum modulation)
Antenna Options	0.5 ft. (16 cm) - 38dBi antenna gain (not applicable for FCC regulation) 1 ft. (31cm) - 43dBi antenna gain 2 ft. (65cm) - 50dBi antenna gain
Reach	10Gbps: 1.7/2.4 mile (2.7/3.8 km) @ 99.95% availability (2000MHz, rain zone K/E, 2ft ANT.) 2Gbps: 2.4/3.5 mile (3.8/5.6 km) @ 99.95% availability (500MHz, rain zone K/E, 2ft ANT.)
Interfaces	1 combo 10GE port: 802.3ab/bz/an (RJ-45, CAT6a or better) or SFP+ (MMF or SMF) 1GE port: 802.3ab (RJ-45, CAT5 or better)
Power Supply	Dual input: PoE+ or 42±57VDC; 50W; Hot standby
Management & Provisioning	In / Out-of-band management; Web GUI or CLI IPv4 or IPv6 SNMPv2/3, TACACS+, RADIUS Zero-touch turn-up
Ethernet features	Ethernet transparent bridge with flow control VLAN and VLAN stacking ⁽¹⁾ Jumbo frames Configurable QOS aware forwarding: 8-levels H-QOS ⁽¹⁾ , L2: 802.1p, L3: DSCP
Security	AES 128-bits (order based HW model)
Conformance	Radio: USA FCC Part 15.101 & ETSI EN 302 217; EMC: USA FCC 47CFR.part 15 & ETSI EN 301 489; Safety UL/EN 60950
Environmental	Operating Temperature: -45° to +55°C (-49° to +131°F) Ingress Protection Rating: IP67
Dimensions	ODU + 0.5ft antenna: 9.17" x 8.11" x 5.55" (23.3cm x 20.6cm x 14.1cm) ODU + 1ft antenna (Dia. x Depth): 12.6" x 4.3" (32cm x 13cm) ODU + 2ft antenna (Dia. x Depth): 25.6" x 15.35" (65cm x 37cm)
Weight	ODU + 0.5ft antenna: 9.2lbs. (4.1kg) ODU + 1ft. antenna: 9.9lbs. (4.4kg) ODU + 2ft. antenna: 24.3lbs (10.9kg)

(1) HW revision dependent

MultiHaul™ PTMP 60GHz Radio Datasheet



Multi-Gigabit Throughput in an Always-On Point-to-Multipoint Radio

MultiHaul™ is a PTMP multi-gigabit radio operating over millimeter waves. It brings the advantages of mmW – multi-gigabit capacity, immunity to interference and always-on reliability - to a cost effective small form factor PTMP solution. MultiHaul™ is a plug & play system designed to easily scale, taking advantage of patent-pending scanning antennas that auto-align links, and enables connectivity for up to 8 Terminal Units at up to 400 meters range, as well as robust planning and management tools.

A Wide Range of Applications

- Security / Safe City Networks
- Gigabit to the Home
- Smart City
- Business Services
- Wi-Fi Backhaul

Secure and Physically Immune Narrow Beams

MultiHaul™ radios operate over the millimeter wave spectrum using narrow beams. This confers several advantages including complete immunity to interference and network jamming, as well as high security. In contrast to wide-beam wireless systems that need to use multiple strategies to perform in dense areas, and are not successful 100% of the time, MultiHaul™ is inherently interference-free and secure under any circumstances thanks to a unique combination of narrow beams and high frequencies. Multiple subscribers and services can be connected with complete isolation based on physical port, VLAN ID and/or a Terminal Unit.

An Ocean of Spectrum

The MultiHaul™ takes advantage of large millimeter wave spectrum and wide channels in order to bring multi-gigabit 60GHz capacity to a PTMP system with a single Base Unit and up to 8 Terminal Units. With its extremely high reuse factor, the wide spectrum is available anywhere, even in dense urban areas and challenging deployment scenarios.

Ready-Set Go

The plug and play system is designed for an easy single person installation. The patent-pending scanning antenna automatically aligns with the Base Units. For buildings with difficult roof-top access, a single base unit needs to be installed on a roof to serve multiple locations. The Base Unit (BU) supports advanced auto-provisioning: Terminal Units (TU) configuration files are stored in the BU to enable early and advanced provisioning. The TU can be located on building sides with no need for internal re-wiring of buildings to achieve net gigabit throughput.

Always-On Mission Critical Networks

When you can't afford to lose a video stream, critical safe city sensor data or any other mission critical data, you need to use a wireless network that's as reliable and secure as fiber. With maximal immunity to interference and hacker-proof links with embedded AES encryption, MultiHaul™ delivers a network you can count on.

Very Large Scale Planning and Optimization

MultiHaul™ is available with robust network planning and optimization tools that help system integrators and large operators scale their networks fast and with low overhead.

Fiber Quality with Wireless Flexibility

Siklu's millimeter wave radios successfully combine the capacity of fiber with the flexibility, speed of deployment and low TCO of wireless networks. That's what makes them the world's best-selling millimeter wave radios every year since 2011. They provide rock solid performance, even under severe weather conditions, in thousands of networks around the globe.



MultiHaul™ Specifications



The main specifications of the MultiHaul™ Base Units (BU) and Terminal Units (TU) are outlined in the following table. Some specific details are part number dependent, and identified at the part number level in the ordering documents. Part numbers: MH-B100-CCS-PoE-MWB; MH-T200-CNN-PoE-MWB; MH-T200-CCC-PoE-MWB

		BU MH-B100-CCS	TU MH-T200-CCC	TU MH-T200-CNN
Topologies	Point to Multi-point Point to Point	✓	✓	✓
Built-in Antenna	Horizontal scanning: 90° Vertical beam-width: 20°	✓	✓	✓
Frequency & Duplexing	57-64GHz	✓	✓	✓
Channels & Width	2 non-overlapping channels, 2160MHz wide	✓	✓	✓
Modulation & Coding	9 level of adaptive coding and modulation	✓	✓	✓
Line Rate (PHY)	Line rate up to (Mbps)	2300	2300	2300
Aggregate Throughput ⁽¹⁾	Max capacity (Mbps), license dependent	1800	1000	1000
System Gain (link budget)	128.5dB (including antenna gain)	✓	✓	✓
Typical Reach	900-1300ft. (280-400m). Detailed performance calculations - see Siklu's online link budget calculator: siklu.com/toolsetherhaul_lbc/	✓	✓	✓
Interfaces	Up to 3x RJ-45 100/1000 Base-T	-	3	1
	2x RJ-45 100/1000Base-T + 1x SFP (supports 1GbE & 2.5GbE)	✓	-	-
Terminal Units (TU)	Up to 8 Terminal Units	✓	-	-
Ethernet Features	IEEE 802.1d transparent bridging Provider bridge - VLAN & VLAN stacking Jumbo frames; Port isolation; TU isolation; LLDP	✓	✓	✓
Security	AES 128-bits	✓	✓	✓
Management & Provisioning	TU auto-provisioning; In-band, out-of-band management Web GUI (one-click configuration of local and remote units) & Embedded CLI; SNMPv2/3, TACACS+, RADIUS	✓	✓	✓
Conformance	Radio: US FCC 47 CFR Part 15.255; Japan Radio Equipment Certification Ordinance 2-1-19-4-2. EMC: US FCC 47 CFR Part 15; EN 301 489 Safety: UL 60950	✓	✓	✓
Power Supply	PoE, 10W (IEEE 802.3af) without PoE-Out, 55W with PoE-Out (IEEE 802.3at+)	✓	✓	✓
PoE-Out	ETH2: 26W, 802.3at ETH3: 13W, 802.3af	✓ (SFP)	✓ ✓	- -
Environmental	Operating Temperature: -22°F ÷ 131°F (-30°C ÷ 55°C); Optional -49°F ÷ 131°F (-45°C ÷ 55°C) Ingress Protection Rating: IP65 (optional IP67)	✓	✓	✓
Dimensions (HxWxD)	7.5 x 5.2 x 3.5 in.	✓	✓	✓
Weight	3 lbs. (including mounting kit)	✓	✓	✓

¹ Actual throughput varies with traffic patterns to/from the Terminal Units